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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/811,509	03/20/2001	John Shannon	9958-002-27 CONT	1381

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Supervisor, Patent Prosecution Services
PIPER MARBURY RUDNICK & WOLFE LLP
1200 Nineteenth Street, N.W.
Washington, DC 20036-2412

EXAMINER

CHEN, SHIN LIN

ART UNIT	PAPER NUMBER
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1632

DATE MAILED: 10/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/811,509

Applicant(s)

SHANNON ET AL.

Examiner

Shin-Lin Chen

Art Unit

1632

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 3-3-03, 4-30-03, 5-2-03, 6-25-03, 9-2-03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23-32 is/are pending in the application.
- 4a) Of the above claim(s) 24,25,27,30 and 32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23,26,28,29 and 31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Applicants amendments filed 3-3-03, 4-30-03, 5-2-03, 6-25-03 and 9-2-03, and declaration of Dr. Martin Alan Winkler have been entered. Claims 23, 26, 28, 29 and 31 have been amended. Claims 23-32 are pending and claims 23, 26, 28, 29 and 31 are under consideration.

Double Patenting

1. Applicant is advised that should claim 23 be found allowable, claim 31 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 23, 26, 28, 29 and 31 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 23, 26, 28, 29 and 31 are directed to a method of recovering metals and minerals from sea water by contacting a sponge harboring a bacteria capable of concentrating said metals or mineral with said sea water and recovering the concentrated metal or mineral from the bacteria. Claim 26 specifies the bacteria is selected from the group recited in the claim. Claims 28 and 29 specify the bacteria are *Pedomicrobium* and cyanobacteria, respectively.

The claims encompass using a sponge harboring any bacteria capable of concentrating metals and minerals, wherein said bacteria could cultivate on the sponge and accumulate metals and minerals. The specification of the present application only provides a proposal of farming 2,000,000 sponges to collect over 3.8 million troy ounces of gold. The prior art of the present application indicates several different species of bacteria can accumulate gold, silver, and other minerals from seawater, and a psychrophilic crenarchaeon inhabits a marine sponge and a mercuric ion reductase gene, *MerA*, which converts toxic Hg^{2+} to the less toxic relatively inert metallic mercury (Hg^0), was modified and used to generate transgenic *Arabidopsis thaliana* which is resistant to toxic Hg^{2+} .

The specification of the present application fails to provide adequate guidance and evidences for how a bacteria capable of concentrating metals or minerals could be delivered to the flora of sponges and populate sponges such that said bacteria could grow to reach appreciable numbers so as to be able to concentrate metals and minerals. The specification of the present application fails to provide adequate guidance and evidences for whether any of the symbiotic bacteria of a sponge could concentrate any metal or any mineral. Preston et al., 1996 (specification, page 5) only discloses a psychrophilic crenarchaeon inhabits a marine sponge, there is no evidence of record that said psychrophilic crenarchaeon could accumulate metals or

Art Unit: 1632

minerals. The specification fails to provide adequate guidance and evidence whether the bacteria, known in the art and disclosed in the specification, that is capable of concentrating metals or minerals and any symbiotic bacteria of a sponge could cultivate on a sponge and obtain an appreciable numbers so as to concentrate metals or minerals on the sponge from the seawater.

Wilkinson et al., 1981 (Microb. Ecol., Vol. 7, p. 13-21) indicates that bacterial symbionts are common within many marine sponges and there is a large mixed populations of morphologically different bacteria in the mesophyl of marine sponges (e.g. p. 7, 8). Wilkinson, 1980 (Endocytobiology, Endosymbiosis and Cell Biology, "Cyanobacteria Symbiotic in Marine Sponges", Edited by Schwemmler et al., Walter de Gruyter & Co, Berlin, p. 553-563) reports that both unicellular and multicellular cyanobacteria have symbiotic relationship with Mediterranean sponges. Two different unicellular cyanobacteria, *Aphanocapsa feldmanni* and *A. raspaigellae*, were describe in Mediterranean sponges and about 4 different multicellular cyanobacteria have been reported in Mediterranean and coral reef sponges (e.g. p. 553, 557). However, Latyshev et al., 1992 (Comp. Biochem. Physiol., Vol. 102B, No. 4, pp. 961-965) states that symbiotic relations of sponges are complicated, which include intracellular autotrophic (cyanobacteria, microalgae) and heterotrophic (yeast, bacteria) symbionts (e.g. introduction). Faulkner et al., 2000 (Drugs from the sea, Basel, Karger, pp. 107-119) reports that "most sponges contain some microorganisms, the most difficult task is to distinguish symbiotic microbes from those being consumed by the sponge and those that are surface contaminants" (e.g. p. 108). Further, Hsu et al., 1997 (97th General meeting, Miami Beach, Florida, May 4-8, p. 504) states that many invertebrates, such as sponges, were found to be associated with symbiotic bacteria, however, these bacteria are difficult to be cultivated and their presence can only be

Art Unit: 1632

observed under microscope. Wilkinson et al., 1981, show two methods to isolate bacteria from sponges that require culturing the bacteria on the sponge in OZR agar plates (e.g. p. 14). In view of the evidences set forth above, it appears that there is a mixed populations of different bacteria on the sponges, and it is difficult to separate the symbiotic bacteria from other bacteria and since the amount of the bacteria on the sponge is low it is also difficult to detect the presence of the bacteria and cultivate bacteria on the sponges. Further, there is no evidence of record that bacteria, such as cyanobacteria, that is symbiotic with sponges can propagate on the sponges to an appreciable number so as to accumulate metals or minerals. Thus, one skilled in the art at the time of the invention would not know how to use the claimed sponge harboring any bacteria for concentrating and recovering minerals or metals from sea water.

In view of the lack of guidance for cultivating bacteria capable of accumulating metals or minerals on a sponge such that sufficient numbers of bacteria are obtained so as to concentrate the metals and minerals and the lack of evidence that any symbiotic bacteria of a sponge could concentrate metals or minerals, it would have required a skilled artisan at the time of the invention undue experimentation to practice over the full scope of the invention claimed.

The quantity of experimentation to practice the claimed invention would include: isolation and characterization of various symbiotic bacteria of a sponge having the ability to concentrate metals and minerals, trial and error experimentation to grow the bacteria capable of concentrating metals and minerals or said symbiotic bacteria on the sponge, and trial and error experimentation to determine whether said bacteria could cultivate on a sponge to obtain sufficient numbers so as to concentrate and recover metals or minerals on the sponge.

Applicants argue that experimentation may be complex but it is not necessary to be undue and the specification fully supports the prophetic example and the basis of their invention but Examiner has not provided a reference that indicates Applicants' statements are untrue or lack of reasonable basis of belief. Applicants further argue that it is not necessary to have working examples and applicants need not have actually reduced the invention to practice prior to filing. Applicants also argue that the specification discloses that Cyanobacteria are symbionts of sponges and also discloses the high degree of symbiosis known between the disclosed bacteria and sponges (amendment filed 3-3-03, p. 3-5). This is not found persuasive because of the reasons set forth above under 35 U.S.C. 112 first paragraph rejection.

Applicants cite Dr. Winkler's declaration filed 4-30-03 and argue that the present claimed invention is fully enabled and no undue experimentation is required to practice the claimed invention. Dr. Winkler's declaration also discusses successful modification of transgenic organisms to be active bioaccumulator of target metals and the specification teaches how to isolate and identify genes and prepare transgenic organisms. This is not found persuasive because of the reasons set forth above under 35 U.S.C. 112 first paragraph rejection and that the claimed invention is directed to the use of a sponge harboring a bacteria, which is not transgenic, capable of concentrating said metals or mineral. Use of transgenic bacteria is drawn to non-elected invention (see Paper Nos. 3 and 5) and is irrelevant to the present claimed invention.

Conclusion

No claim is allowed.

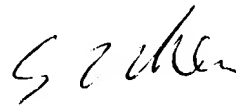
Art Unit: 1632

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shin-Lin Chen whose telephone number is (703) 305-1678. The examiner can normally be reached on Monday to Friday from 9:30 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Reynolds can be reached on (703) 305-4051. The fax phone number for this group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, whose telephone number is (703) 308-0196.

Shin-Lin Chen, Ph.D.

A handwritten signature in black ink, appearing to read 'S. L. Chen', is positioned to the right of the printed name.